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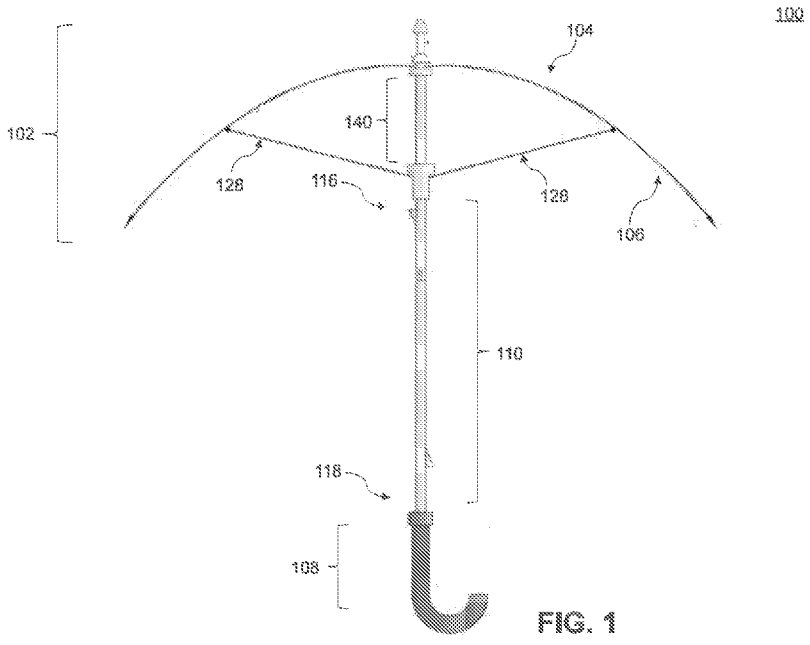

FIG. 1

(57) Abstract: An umbrella assembly is described. Manual movement of a knob away from a handle moves each rib and a canopy to a position outside of an inner hollow component of a frame such that the umbrella assembly is in an open and in-use position. In the open and in-use position, a shape of each rib of the set of ribs is curved. Elastic potential energy of a spring located within the inner hollow component of the frame retracts each rib and the canopy into the inner hollow component of the frame. Each rib comprises a bending resistance such that when each rib is retracted into the inner hollow component of the frame, a shape of each rib moves towards a planar shape.

[Continued on next page]

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UMBRELLA ASSEMBLY

Cross-Reference to Related Application Section

This application is a PCT Application that claims priority from U.S. Provisional Application No . 63/140,335 filed on January 22, 2020, the entire contents of which are hereby incorporated by reference in their entirety.

Field of the Embodiments

The field of the invention and its embodiments relate to an improved umbrella assembly.

Background of the Embodiments

An umbrella or parasol is a folding canopy supported by wooden or metal ribs that is usually mounted on a wooden, metal, or plastic pole. An umbrella is designed to protect a person against environmental elements, such as rain, snow, or sunlight. Umbrellas may be both portable and stationary. Portable umbrellas may comprise light-weight materials and a minimum amount of structure for ease of transportation. However, such materials may result in the umbrella's moving parts being destroyed when exposed to unpredictable high winds to an extent that the umbrella is no longer usable. Moreover, some umbrellas are difficult to expand into an in-use and open position and to retract into a non-use and stored position. Thus, what is needed is an improved umbrella assembly that is configured to maintain the frame integrity of the umbrella and is also easy for a user to convert from a non-use position to an in-use position.

Review of related technology:

U.S. Patent No. 10,441,040 B2 describes an umbrella. The umbrella has a canopy, a main shaft, and a plurality of ribs pivotally attached to the main shaft. Each rib is of adjustable length and includes a pair of outer rib elements. The outer rib elements are flexible and normally adopt a straight configuration aligned with the main shaft in a closed position of the umbrella. In an open position of the umbrella, the outer rib elements flex so that outer ends of the outer rib elements extend generally circumferentially with respect to the canopy. The umbrella can have ribs that would normally be of one piece, in which case accommodation is made for an effective change in the radius of the ribs as the outer rib elements flex.

U.S. Patent No. 10,182,627 B2 describes a sunshade apparatus, such as an umbrella or sunshade, that includes a canopy with extendable portions that may be positioned in a manner so as to maximize shade. The sunshade device includes a canopy and a rib assembly connected to a shaft. The rib assembly includes a first joint coupled to a first assembly arm. The first joint connects a first arm extension to the rib assembly at a first angle with respect to a surface. The rib assembly also includes a second joint is coupled to a second assembly arm. The second joint connects a second arm extension to the rib assembly at a second angle with respect to the surface.

U.S. Patent No. 9,629,428 B1 relates to a sunshade apparatus, such as an umbrella or sunshade, that includes a canopy with extendable portions that may be positioned in a manner so as to maximize shade. The sunshade device includes a canopy and a rib assembly connected to a shaft. The rib assembly includes a first joint coupled to a first assembly arm. The first joint connects a first arm extension to the rib assembly at a first angle with respect to a surface. The rib assembly also includes second joint coupled to a second assembly arm. The second joint

connects a second arm extension to the rib assembly at a second angle with respect to the surface.

U.S. Patent No. 9,526,306 B2 describes an umbrella assembly. The umbrella assembly includes a housing for a canopy. The umbrella assembly has a mechanism powered to open and close the canopy. During opening, the canopy slides upward through the housing and extends outward in a blooming formation.

U.S. Patent No. 9,468,273 B1 describes a retractable umbrella that includes a canopy with supporting ribs and a shaft with a handle located on a proximal end thereof. Inside the shaft resides an electric motor and a gearing mechanism for power transmission. When activated, the electric motor actuates the gearing mechanism to extend and retrieve the canopy from and into the shaft.

U.S. Patent No. 9,526,306 B2 describes an umbrella assembly that includes a housing for a canopy. The umbrella assembly has a mechanism powered to open and close the canopy. During opening, the canopy slides upward through the housing and extends outward in a blooming formation.

GB 2525477 A describes a collapsible umbrella-like device comprising flexible ribs and a hollow storage tube. The device includes short restraining lines connected to the flexible ribs at one end and to a portion of the tube at their other end. When the ribs are pushed out of an open end of the tube, the restraining lines pull on the flexible ribs causing them to arc downwards. The device may comprise a reservoir for collecting rain that falls on the canopy. The canopy of the device may include photovoltaic cells or solar thermal collectors. Also disclosed is an umbrella-like device that makes use of a reel to control the extension of two or more flexible shafts.

WO 2006/048026 A1 relates to a folding umbrella comprising: a longitudinal tube shaft which contains the entire umbrella mechanism therein, a system of flexible rods which are fixed in place using wires that are anchored inside the tubular shaft, a polygonal piece of fabric which is supported by the flexible rod system and which forms a small protective awning in the extended position, an elastic element which guides the fabric when the umbrella is being closed, a mechanism comprising grooved and perforated stop elements, springs and coils which enable the entire system to be correctly extended and compressed and which are used to maintain the umbrella in the open position, a cord enabling the umbrella closure mechanism to be correctly actuated and the umbrella to be transported, a tube closure device which is designed to house the umbrella in the folded position, and a system fastening/release hook.

U.S. Published Patent Application No. 2009/0223545 A1 relates to an umbrella system, substantially comprising an umbrella with elements that include a hollow shaft, a cover, as well as a frame consisting of ribs and stretchers mounted on the exterior of the hollow shaft. When retracted, the cover is stowed inside the shaft. When deployed, the umbrella's cover is supported by ribs and stretchers as well as by the shaft. Ribs and stretchers slide along the hollow shaft's exterior as the invention's cover is deployed and retracted.

U.S. Patent No. 8,225,806 B1 describes an umbrella having housing with a deployable canopy extendable and retractable therefrom. The canopy comprises a material covering supported by flexible ribs and rib extension retainer cords. The umbrella further provides an adjustable strap extending between the exterior distal ends and a handle on one distal end of a flexible collapsible material. The adjustable strap further provides a D-ring and clasp on one end allowing for removal of said strap.

Various umbrellas exist. However, their means of operation are substantially different from the present disclosure, as the other inventions fail to solve all the problems taught by the present disclosure.

Summary of the Embodiments

The present invention and its embodiments relate to an improved umbrella assembly.

A first embodiment of the invention describes an umbrella assembly. The umbrella assembly generally comprises a canopy component, a handle component, and a frame component. The canopy component comprises an interior side disposed opposite an exterior side. The exterior side of the canopy component comes into contact with an environmental condition, such as rain. As such, a material of the canopy component may be a water or weather resistant material, such as a nylon material or a polyester material.

The frame component of the umbrella assembly is affixed between the canopy component and the handle component. In some examples, the handle component may comprise a non-slip material. In other examples, the handle component may comprise a portion of non-slip material. The frame component has a first end disposed opposite a second end. Moreover, a body portion is located between the first end and the second end of the frame component. The first end of the frame component comprises an opening and the second end of the frame component engages the handle component.

The body portion of the frame component includes an inner hollow component surrounded by an outer component. The inner hollow component of the frame component is configured to house numerous components that are used for the functioning of the umbrella

assembly, such as: a spring, a set of ribs, a seat component, a support rod, and/or a base component, among other components not explicitly listed herein.

The spring has a first end disposed opposite a second end, where the second end is affixed to the base component proximate the second end of the frame component. The base component is substantially planar in shape. In some examples, the spring is an extension spring. In other examples, the spring is a compression spring. However, it should be appreciated that the spring is not limited to these examples, as such examples are provided for illustrative purposes only.

Each rib of the set of ribs has a first end disposed opposite a second end. The first end of each rib of the set of ribs is affixed to the interior side of the canopy component. The first end of a first subset from the set of ribs are affixed to a first location along a periphery of the interior side of the canopy component. Further, the first end of a second subset from the set of ribs are affixed to a second location on the interior side of the canopy component. It should be appreciated that the first location differs from the second location. Moreover, the second location is proximate a center of the canopy component as compared to the first location. Further, it should be appreciated that in some examples, the first end of each rib of the set of ribs may be curved in a horn shape (e.g., similar to that of a shoe horn) to allow for easy retraction into the inner hollow component of the frame component. A material of each rib of the set of ribs may be a metal material, a fiberglass material, or a plastic material, among other materials not explicitly listed herein. Unlike traditional systems, the instant invention requires no such string/restraining line for the set of ribs.

In some examples, the seat component is substantially cylindrical in shape. The seat component has a first side disposed opposite a second side. The first side of the seat component

is configured to receive the second end of each rib of the set of ribs. The second side of the seat component is affixed to the first end of the spring.

The support rod has a first side disposed opposite a second side. The first side of the support rod is configured to contact the interior side of the canopy component. The second side of the support rod contracts the first side of the seat component.

A manual mechanism to open and close the umbrella assembly is also described. The outer component of the frame component comprises a knob affixed to a planar portion. The planar portion is located partially within the inner hollow component and extends to a location outside of the frame component. The planar portion is affixed to the seat component such that a force exerted on the knob in a direction away from the handle component (e.g., an upward direction) moves each rib of the set of ribs from the closed position within the inner hollow component of the body portion of the frame component to the open position at a location outside of the frame component. This movement also brings the canopy component to a position outside of the frame component. An elastic potential energy of the spring retracts each rib of the set of ribs and the canopy component into the inner hollow component of the body portion of the frame component.

In some examples, the knob comprises a lock component that may lock the knob in the open position or the closed position. In other examples, the second side of the support rod may include a hook component that may be configured to engage the first end of the spring component in an event that the lock component becomes accidentally disengaged or fails to function as expected.

In some examples, the body portion of the frame component may comprise one or more openings (or vent holes) disposed therethrough to allow the canopy component to dry.

Brief Description of the Drawings

FIG. 1 depicts a schematic diagram of an umbrella assembly, according to at least some embodiments disclosed herein.

FIG. 2 depicts a schematic diagram of a frame component of an umbrella assembly, according to at least some embodiments disclosed herein.

FIG. 3 depicts a schematic diagram of an interior of an umbrella assembly, according to at least some embodiments disclosed herein.

FIG. 4 depicts a schematic diagram of a spring and a set of ribs of an umbrella assembly, according to at least some embodiments disclosed herein.

FIG. 5 depicts a schematic diagram of a shape of a rib of an umbrella assembly in an open and in-use position, according to at least some embodiments disclosed herein.

FIG. 6 depicts a schematic diagram of a shape of a rib of an umbrella assembly in a closed and non-use position, according to at least some embodiments disclosed herein.

FIG. 7 depicts a schematic diagram of a base component, a spring, and a seat component of an umbrella assembly, according to at least some embodiments disclosed herein.

FIG. 8 depicts a schematic diagram depicting movement of a knob of an umbrella assembly from an open and in-use position to a closed and non-use position, according to at least some embodiments disclosed herein.

FIG. 9 depicts a schematic diagram of a hook component affixed to a rod component of an umbrella assembly, according to at least some embodiments disclosed herein.

FIG. 10 depicts a schematic diagram of openings located on a handle component of an umbrella assembly, according to at least some embodiments disclosed herein.

Description of the Preferred Embodiments

The preferred embodiments of the present invention will now be described with reference to the drawings. Identical elements in the various figures are identified with the same reference numerals.

Reference will now be made in detail to each embodiment of the present invention. Such embodiments are provided by way of explanation of the present invention, which is not intended to be limited thereto. In fact, those of ordinary skill in the art may appreciate upon reading the present specification and viewing the present drawings that various modifications and variations can be made thereto.

As used herein, the singular forms "a," "an," and "the," are intended to include the plural forms as well, unless the context clearly indicates otherwise.

The phrase "and/or," as used herein in the specification and in the claims, should be understood to mean "either or both" of the elements so conjoined, i.e., elements that are conjunctively present in some cases and disjunctively present in other cases. Thus, as a non-limiting example, a reference to "A and/or B", when used in conjunction with open-ended language such as "comprising" can refer, in one embodiment, to A only (optionally including elements other than B); in another embodiment, to B only (optionally including elements other than A); in yet another embodiment, to both A and B (optionally including other elements); etc.

As used herein in the specification and in the claims, the phrase "at least one," in reference to a list of one or more elements, should be understood to mean at least one element selected from any one or more of the elements in the list of elements, but not necessarily including at least one of each and every element specifically listed within the list of elements and

not excluding any combinations of elements in the list of elements. This definition also allows that elements may optionally be present other than the elements specifically identified within the list of elements to which the phrase "at least one" refers, whether related or unrelated to those elements specifically identified. Thus, as a non-limiting example, "at least one of A and B" (or, equivalently, "at least one of A or B," or, equivalently "at least one of A and/or B") can refer, in one embodiment, to at least one, optionally including more than one, A, with no B present (and optionally including elements other than B); in another embodiment, to at least one, optionally including more than one, B, with no A present (and optionally including elements other than A); in yet another embodiment, to at least one, optionally including more than one, A, and at least one, optionally including more than one, B (and optionally including other elements); etc.

It will be further understood that the terms "comprises," "comprising," "includes," and/or "including," when used herein, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.

An umbrella assembly 100 is described and depicted herein in at least FIG. 1, FIG. 3, and FIG. 4. As shown in at least FIG. 1, the umbrella assembly 100 generally comprises a canopy component 102, a handle component 108, and a frame component 110. The frame component 110 allows for the containment, storage, protection and mobility of the several components of the umbrella assembly 100, which will be discussed in turn.

The canopy component 102 comprises an interior side 106 disposed opposite an exterior side 104. The exterior side 104 of the canopy component 102 comes into contact with a weather event, such as rain. As such, a material of the canopy component 102 may be a water or weather resistant material, such as a nylon material or a polyester material. Though materials comprising

the canopy component 102 have been explicitly listed herein, such listing is for illustrative purposes only and other materials are contemplated.

The frame component 110 is affixed between the canopy component 102 and the handle component 108. The handle component 108 may be of any shape and the handle component 108 is not limited to a curved shape as shown in FIG. 1. In some examples, the handle component 108 may comprise a non-slip material. In other examples, the handle component 108 may comprise a portion of non-slip material.

As shown in FIG. 1 and FIG. 2, the frame component 110 has a first end 116 disposed opposite a second end 118. Moreover, a body portion is located between the first end 116 and the second end 118 of the frame component 110. As shown in various figures, the first end 116 of the frame component 110 flares outward. However, the shape of the frame component 110 is not limited to any particular shape. The first end 116 of the frame component 110 comprises an opening 146. The second end 118 of the frame component 110 engages the handle component 108.

As shown in FIG. 2, the body portion of the frame component 110 includes an inner hollow component 112 surrounded by an outer component 114. The inner hollow component 112 of the frame component 110 is configured to house numerous components that are used for the functioning of the umbrella assembly 100, such as: a spring 122 (of FIG. 3, FIG. 4, FIG. 5, FIG. 6, FIG. 7, and FIG. 8), a set of ribs 128 (of FIG. 1, FIG. 3, FIG. 4, FIG. 5, and FIG. 6), a seat component 134 (of FIG. 3 and FIG. 7), a support rod 140 (of FIG. 1, FIG. 3, and FIG. 9), and/or a base component 152 (of FIG. 3, FIG. 4, FIG. 7, and FIG. 8), among other components not explicitly listed herein.

The spring 122 has a first end disposed opposite a second end, where the second end is affixed to the base component 152 proximate the second end 118 of the frame component 110. The base component 152 is substantially planar in shape and may comprise any geometric shape. In some examples, the spring 122 is an extension spring. In other examples, the spring 122 is a compression spring. It should be appreciated that the spring 122 may be another type of spring not explicitly listed herein.

Each rib of the set of ribs 128 has a first end disposed opposite a second end. The first end of each rib of the set of ribs 128 is affixed to the interior side 106 of the canopy component 102. The first end of a first subset from the set of ribs 128 are affixed to a first location along a periphery of the interior side 106 of the canopy component 102. Further, the first end of a second subset from the set of ribs 128 are affixed to a second location on the interior side 106 of the canopy component 102. It should be appreciated that the first location differs from the second location. Moreover, the second location is proximate a center of the canopy component 102 as compared to the first location. As such, the second subset from the set of ribs 128 may be shorter in length than the first subset from the set of ribs 128. Further, it should be appreciated that in some examples, the first end of each rib of the set of ribs 128 may be curved in a horn shape (e.g., similar to that of a shoe horn) to allow for easy retraction into the inner hollow component 112 of the frame component 110. A material of each rib of the set of ribs 128 may be a metal material, a fiberglass material, or a plastic material, among other materials not explicitly listed herein. Unlike traditional systems that require use of a string/restraining line to pull on the flexible ribs (e.g., the set of ribs 128) to cause them to arc downwards, the instant invention requires no such string/restraining line.

In some examples, the seat component 134 is substantially cylindrical in shape. The seat component 134 has a first side disposed opposite a second side. The first side of the seat component 134 is configured to receive the second end of each rib of the set of ribs 128. The second side of the seat component 134 is affixed to the first end of the spring 122.

The support rod 140 has a first side disposed opposite a second side and is substantially cylindrical in shape. The first side of the support rod 140 is configured to contact the interior side 106 of the canopy component 102. The second side of the support rod 140 contracts the first side of the seat component 134.

A manual mechanism to open and close the umbrella assembly 100 is also described. The outer component 114 of the frame component 110 comprises a knob 148 affixed to a planar portion 150. The planar portion 150 is located perpendicular to the frame component 110. The planar portion 150 is located partially within the inner hollow component 112 and extends to a location outside of the frame component 110.

As shown in FIG. 8, the planar portion 150 is affixed to the seat component 134. Moreover, a force exerted on the knob 148 by the user in a direction away from the handle component 108 (e.g., an upward direction) from a first location 162 to a second location 160 moves each rib of the set of ribs 128 from the closed position within the inner hollow component 112 of the body portion of the frame component 110 to the open position such that each rib of the set of ribs 128 and the canopy component 102 are moved to a location outside of the frame component 110. The open or in-use position of the canopy component 102 may also be referred to as a blooming formation or configuration. It should be appreciated that the force exerted on the knob 148 in the upward direction results in the open position due to the spring 122 being extended.

When a lock component/mechanism is not used or is disengaged, an external force exerted by the user is not needed to bring the spring 122 from the second location 160 to the first location 162 (e.g., moving each rib of the set of ribs 128 from an open position or an in-use position to a closed position or a non-use position by retracting each rib of the set of ribs 128 and the canopy component 102 into the inner hollow component 112 of the body portion of the frame component 110). In fact, the elastic potential energy of the spring 122 draws each rib of the set of ribs 128, as well as the canopy component 102, back into the inner hollow component 112 of the body portion of the frame component 110. As described herein, "elastic potential energy," is potential energy stored as a result of deformation of an elastic object, such as the stretching of the spring 122. The elastic potential energy is equal to the work done to stretch the spring 122, which depends upon the spring 122 constant k, as well as the distance stretched. According to Hooke's law, the force required to stretch the spring will be directly proportional to the amount of stretch. The force has the form $F = -kx$, where the work done to stretch the spring a distance x is Work = $\frac{1}{2} kx^2$. Thus, as shown in FIG. 8, the knob 148 moves a distance "D" between the open and in-use position to the closed and non-use position.

It should be appreciated that typical collapsible/foldable umbrella assemblies are known in the art. However, such systems require use of a string/restraining line to pull on the flexible ribs to cause them to arc downwards. The instant invention requires no such string/restraining line. In fact, in the open and in-use position, a natural shape of the first end of each rib of the set of ribs 128 is a curved shape, as shown in FIG. 5. Further, in the instant invention, each rib of the set of ribs 128 comprises a bending resistance such that when each rib of the set of ribs 128 is retracted into the inner hollow component 112 of the body portion of the frame component 110,

a shape of each rib of the set of ribs 128 moves towards planar shape, as shown in FIG. 6. No pulley or string is needed by the instant invention for each rib of the set of ribs 128 to bend.

In some examples, the knob 148 comprises a lock component (not shown). The lock component may be configured to lock the knob 148 in the open position or in the closed position. In other examples, and as shown in FIG. 9, the second side of the support rod 140 may include a hook component 154. The hook component 154 may be configured to engage the first end of the spring component 122 in an event that the lock component becomes accidentally disengaged or fails to function as expected.

Though a manual mechanism has been described, an automatic mechanism may also be used. In some examples, the mechanism may be partially or fully automated.

In some examples, and as shown in FIG. 10, the body portion of the frame component 110 may comprise one or more openings 156 (or vent holes) disposed therethrough to allow the canopy component 102 to dry when the canopy component 102 is in the closed or non-use position. In some examples, the one or more openings 156 may be randomly spaced. In other examples, the one or more openings 156 may be spaced in a repetitive pattern.

The descriptions of the various embodiments of the present invention have been presented for purposes of illustration, but are not intended to be exhaustive or limited to the embodiments disclosed. Many modifications and variations will be apparent to those of ordinary skill in the art without departing from the scope and spirit of the described embodiments. The terminology used herein was chosen to best explain the principles of the embodiments, the practical application or technical improvement over technologies found in the marketplace, or to enable others or ordinary skill in the art to understand the embodiments disclosed herein.

Although this invention has been described with a certain degree of particularity, it is to be understood that the present disclosure has been made only by way of illustration and that numerous changes in the details of construction and arrangement of parts may be resorted to without departing from the spirit and the scope of the invention.

Claims

What is claimed is:

1. An umbrella assembly comprising:

a canopy component having an interior side disposed opposite an exterior side;

a handle component; and

a frame component affixed between the canopy component and the handle component, wherein the frame component comprises:

a first end disposed opposite a second end, wherein the first end comprises an opening, and wherein the second end engages the handle component; and

a body portion disposed between the first end and the second end, the body portion comprising an inner hollow component surrounded by an outer component, wherein the inner hollow component comprises:

a spring having a first end disposed opposite a second end, the second end being affixed to a base component proximate the second end of the frame component;

a set of ribs having a first end disposed opposite a second end, wherein the first end of each rib of the set of ribs are affixed to the interior side of the canopy component;

a seat component having a first side disposed opposite a second side, wherein the first side of the seat component is configured to receive the second end of each rib of the set of ribs, and wherein the second side of the seat component is affixed to the first end of the spring; and

a support rod having a first side disposed opposite a second side, wherein the first side of the support rod is configured to contact the interior side of the canopy component, and wherein the second side of the support rod contracts the first side of the seat component;

wherein the outer component comprises a knob affixed to the seat component such that a force exerted on the knob in a direction away from the handle component moves each rib of the set of ribs and the canopy component to a location outside of the inner hollow component of the body portion of the frame component, and

wherein an elastic potential energy of the spring retracts each rib of the set of ribs and the canopy component into the inner hollow component of the body portion of the frame component.

2. The umbrella assembly of claim 1, wherein the first end of each rib of the set of ribs is curved in shape in an open and in-use position.

3. The umbrella assembly of claim 1, wherein each rib of the set of ribs comprises a bending resistance such that when each rib of the set of ribs is retracted into the inner hollow component of the body portion of the frame component, a shape of each rib of the set of ribs represents a planar shape in a closed and non-use position.

4. The umbrella assembly of claim 1, wherein the body portion of the frame component comprises one or more openings disposed therethrough to allow the canopy component to dry.

5. The umbrella assembly of claim 1, wherein the handle component comprises a slip-resistant material.

6. The umbrella assembly of claim 1, wherein the spring comprises an extension spring.

7. The umbrella assembly of claim 1, wherein the spring comprises a compression spring.

8. The umbrella assembly of claim 1, wherein the knob comprises a lock component configured to lock the knob in an open position or a closed position.

9. The umbrella assembly of claim 8, wherein the second side of the support rod comprises a hook component configured to engage the first end of the spring component in an event that the lock component becomes accidentally disengaged.

10. The umbrella assembly of claim 1,

wherein the first end of a first subset from the set of ribs are affixed to a first location along a periphery of the interior side of the canopy component, and

wherein the first end of a second subset from the set of ribs are affixed to a second location on the interior side of the canopy component.

11. The umbrella assembly of claim 10,

wherein the first location differs from the second location, and

wherein the second location is proximate a center of the canopy component as compared to the first location.

12. The umbrella assembly of claim 1, wherein a material of the canopy component is selected from the group consisting of: a nylon material and a polyester material.

13. The umbrella assembly of claim 1, wherein a material of each rib of the set of ribs is selected from the group consisting of: a metal material, a fiberglass material, and a plastic material.

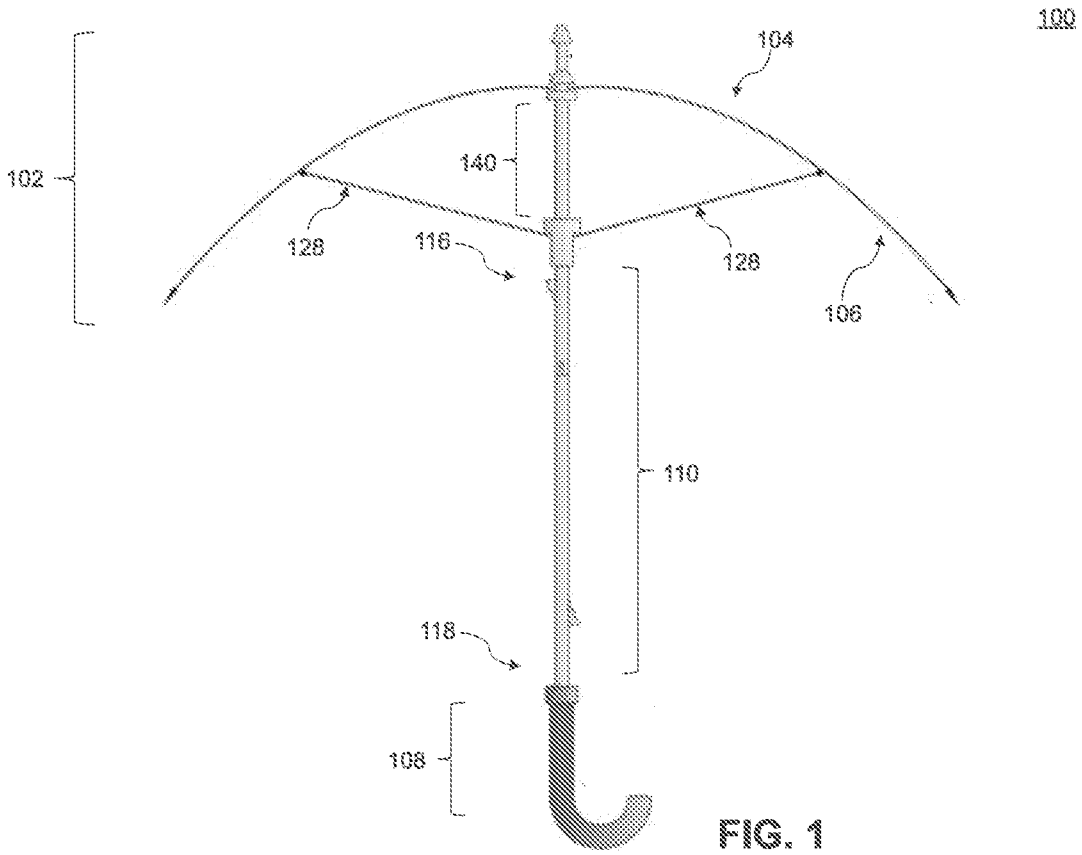

FIG. 1

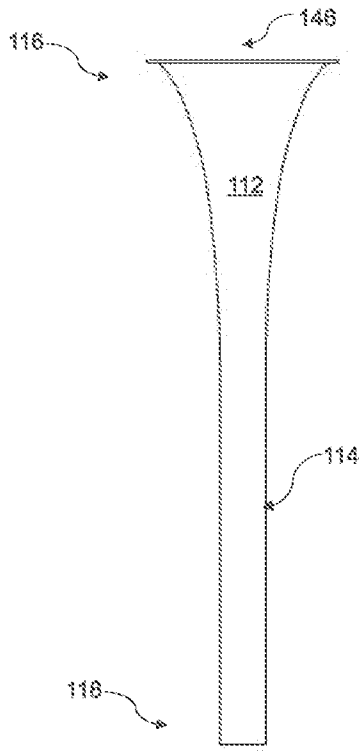

FIG. 2

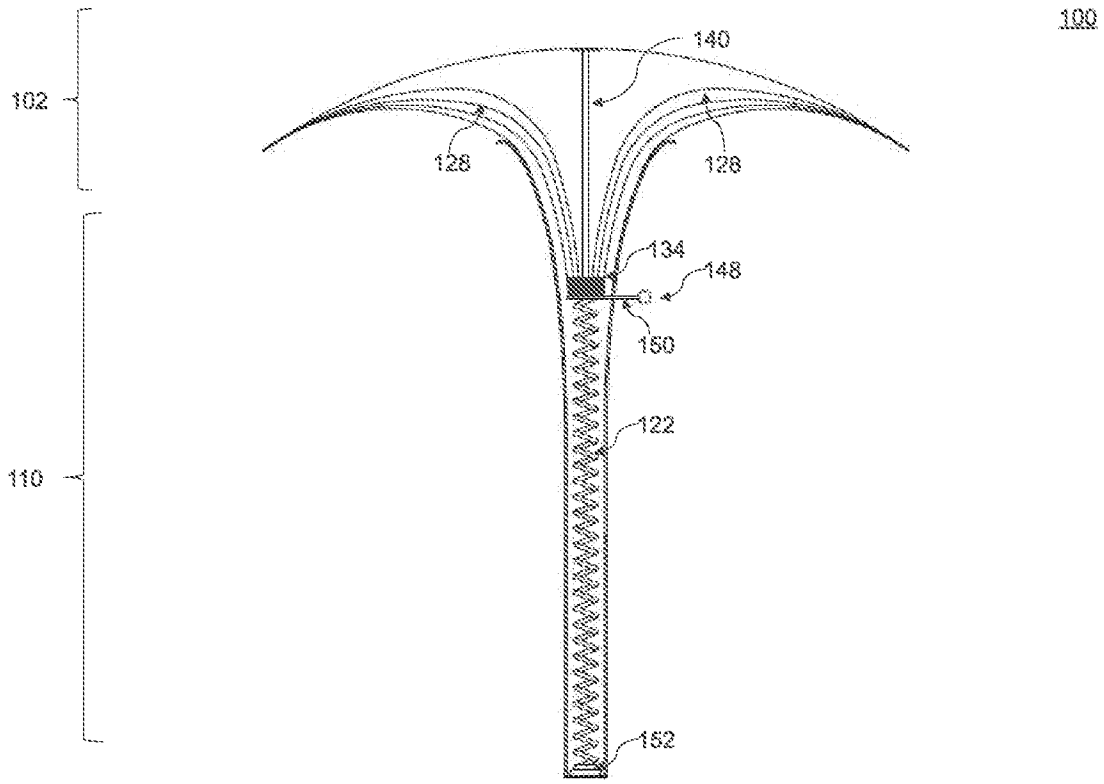

FIG. 3

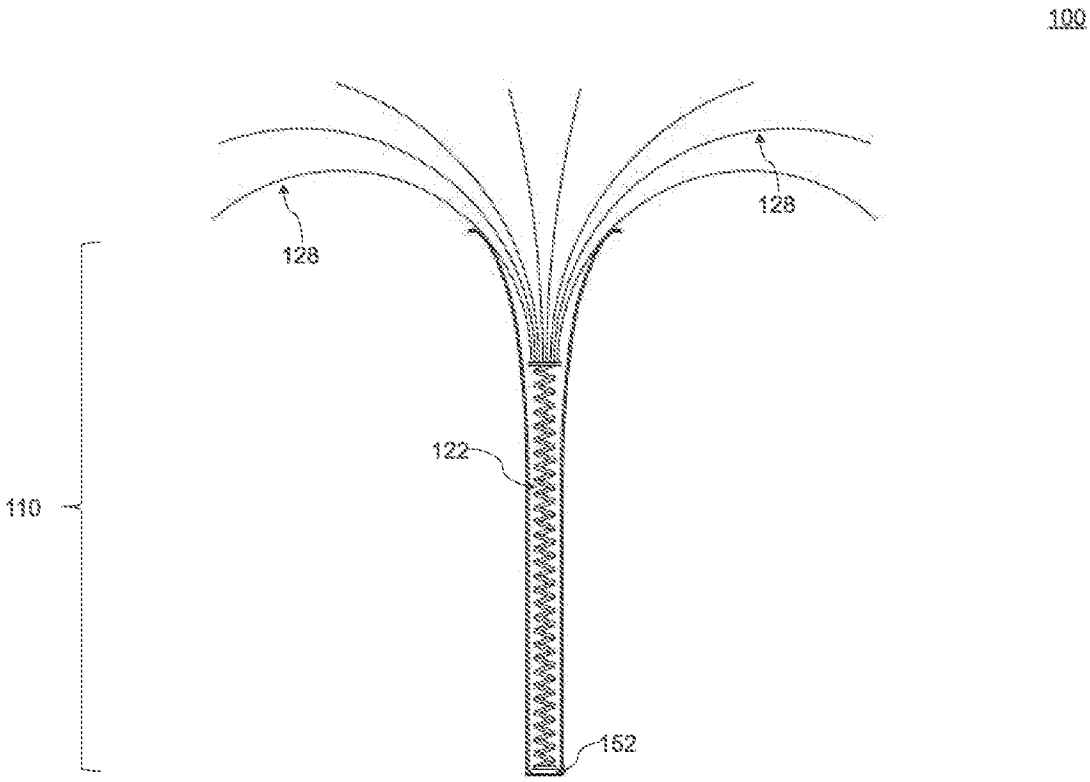

FIG. 4

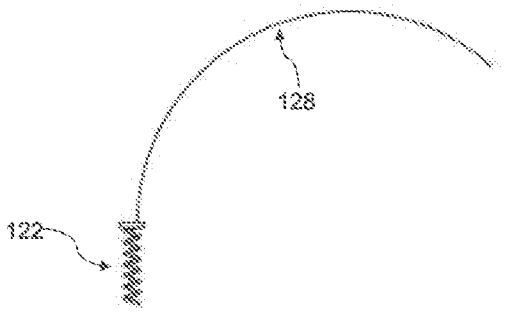

FIG. 5

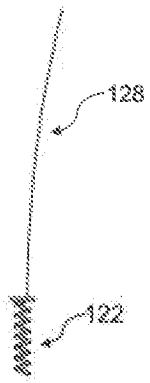

FIG. 6

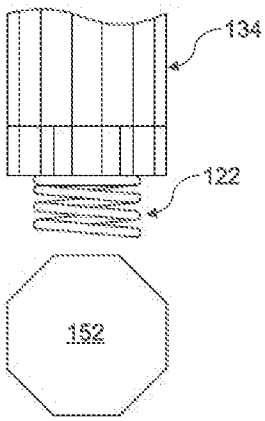

FIG. 7

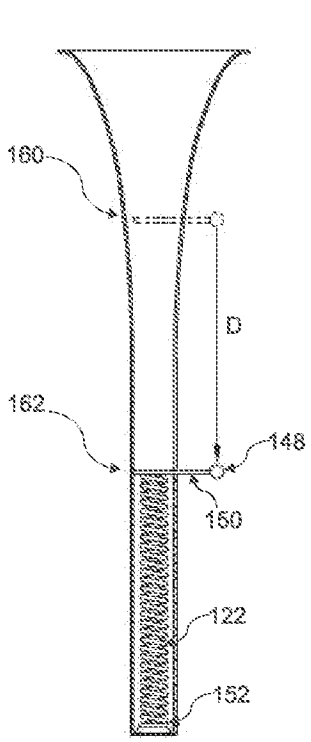

FIG. 8

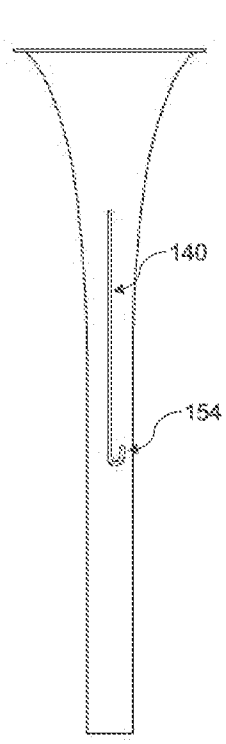

FIG. 9

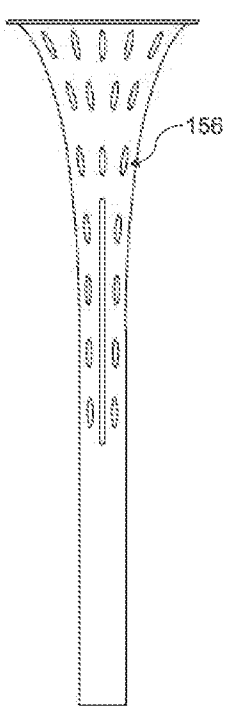

FIG. 10

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 21/60674

A. CLASSIFICATION OF SUBJECT MATTER

IPC - A45B 11/00, A45B 11/02, A45B 19/00, A45B 19/10, A45B 23/00, A45B 25/14 (2022.01)

CPC - A45B 19/00, A45B 2019/001, A45B 2019/008, A45B 11/00, A45B 2011/005, A45B 2019/002, A45B 2025/146, A45B 2200/1027, A45B 23/00, A45B 25/14, A45B 25/24, A45C 13/40, A45B 19/10

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
See Search History document

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
See Search History document

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
See Search History document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2015/0237975 A1 (NG) 27 August 2015 (27.08.2015), entire document	1-8, 10-13
A		9
Y	US 3,435,836 A (VANZINI) 1 April 1969 (01.04.1969), entire document	1-8, 10-13
A		9
Y	US 2019/0069654 A1 (OK UMBRELLA CO., LTD) 7 March 2019 (07.03.2019), entire document	5, 13
A	US 4,548,222 A (DAY) 22 October 1985 (22.10.1985), entire document	9

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
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"D" document cited by the applicant in the international application
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"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
26 JANUARY 2022	FEB 14 2022
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-8300	Authorized officer Kari Rodriquez Telephone No. PCT Helpdesk: 571-272-4300